

Biological Impairment in the Little Creek Watershed: Draft Findings

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Presentation Overview



- Overview of study
- Summary of results
- Brief review of recommendations
- Report schedule

Study Background



- Conducted by DWQ with funding from CWMTF
- One of eleven watersheds studied statewide
- Includes Bolin Creek, Booker Creek and Little Creek upstream of Pinehurst Drive
- Field work conducted in 2000 -- 2002
- Draft report under development

Study Purpose



- Identify causes and sources of biological impairment
- Suggest general strategies for addressing observed problems
- Narrow focus--did not address issues such as fecal coliform, flooding, Jordan Lake

Study Activities



Bioassessment: *benthos and fish* *habitat*

Stream Survey: *channel/riparian* *source*

Chemical Sampling: *baseflow/storm* *water/sediment*

Toxicity Analysis: *acute* *chronic*

Watershed Survey: *land use*

Benthic Sampling Sites



Results



- Overview of biological condition
- Likely causes and sources of impairment

Biological Condition

Little Creek



- Little Creek sampled in 1993, 1998, and 2001 at Pinehurst Drive
- Considered impaired on each occasion
- 303(d) listing as impaired for entire length is correct

Biological Condition

Bolin Creek



- Sampled by DWQ in 1986 at E. Franklin St. and at various sites in 1993, 1998, 2001, 2002
- Creek supported adequate benthos in 1986; impaired in 1993 and following at E. Franklin St.
- Umstead Park area adequate benthos until 2001; now impaired
- Bolin Creek at Homestead Road is not impaired
- Bolin Creek fish community does not indicate impairment (1998, 2001)

Little-Bolin Ck. Macroinvertebrates



Location	Date	EPT Taxa Richness	EPT Abundance	Bioclass- ification
Little Creek at Pinehurst Drive	Feb 93	7	16	Fair
	Feb 98	5	7	Poor
	Mar 01	5	16	Poor
	Jul 01	5	18	Not Rated
Bolin Creek at East Franklin Street	Apr 86	22	145	Good-Fair
	Feb 93	8	32	Fair
	Feb 98	3	22	Poor
	Mar 01	4	33	Poor
	Jul 01	4	31	Poor
Bolin Creek at Village Drive	Apr 93	23	88	Good-Fair
	Feb 98	24	91	Good
	Feb 01	5	35	Poor
	Jul 01	9	36	Fair
	Mar 02	7	38	Fair
Bolin Creek at Homestead Road (SR 1777)	Apr 93	22	76	Good
	Mar 98	22	90	Good
	Apr 00	24	157	Good
	Jul 01	24	112	Good-Fair

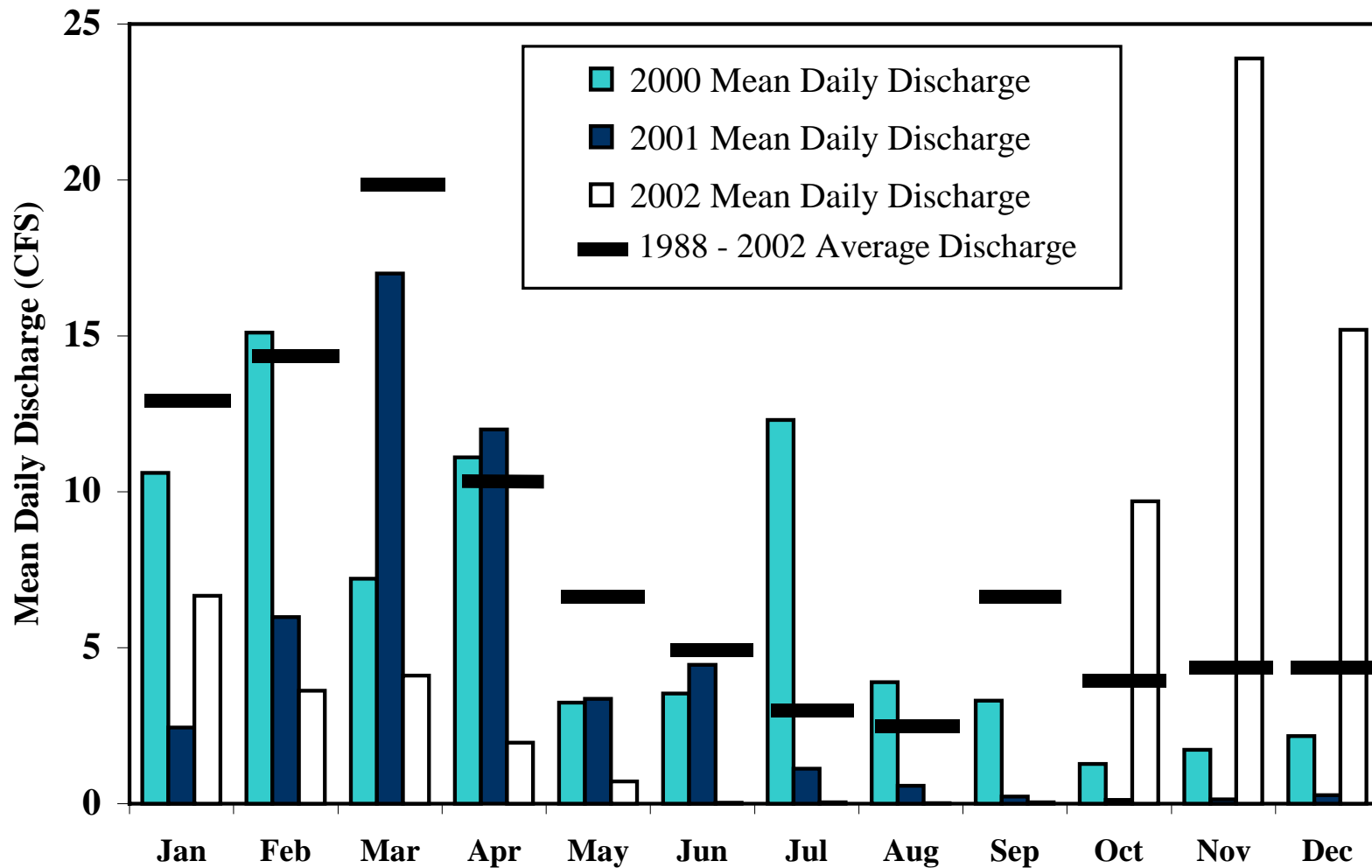
Biological Condition

Booker Creek



- Benthos first sampled at Piney Mt. Rd. in 1998; considered impaired
- 2001 sampling at Piney Mt. Rd., Willow Drive, and Barbara Ct. indicated extremely impacted community
- Stream not rated in 2001 due to its size

Morgan Creek Discharge at NC 54



Little Creek and Lower Bolin Creek

Causes of Impairment--E. Franklin St. to Pinehurst Dr.



- Poor habitat
- Toxicity
- Scour (stormflow volume impacts)
- Low dissolved oxygen in 2002

Little Creek and Lower Bolin Creek



Habitat Impacts

- In-stream habitat poor, especially downstream
- Massive sedimentation downstream
- Limited organic habitat
- Causes:
 - > Past channelization impacts
 - > Altered watershed hydrology
 - > Ongoing riparian area disturbance

Little Creek Above Pinehurst Drive



Little Creek Above Pinehurst Drive



Bolin Creek at E. Franklin St.



Little Creek and Lower Bolin Creek



Toxicity Impacts

- Midge community composition indicates toxicity
- Extensive *Chironomus* deformities in Little Creek
- Limited chemical analysis did not clearly identify problem pollutants
- Sediment toxicity probably not a problem (Little Creek)
- Diverse source areas

Little Creek and Lower Bolin Creek



Scour Impacts

- Increased development >>> frequent scouring of bed and banks by high velocity streamflows
- Contributes to habitat degradation by bank erosion and flushing of organic habitat
- Direct impact by removal of organisms

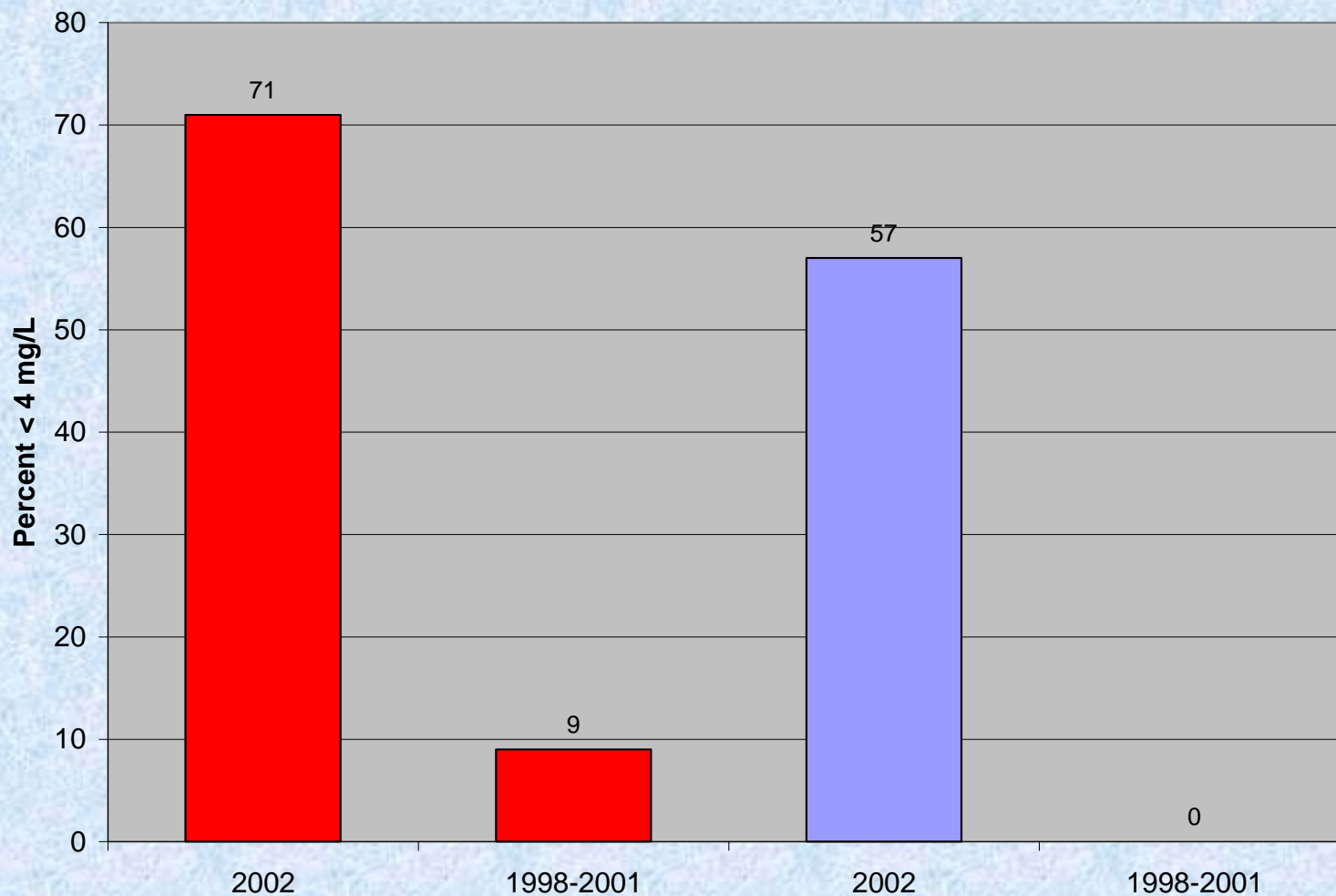
Little Creek and Lower Bolin Creek



Dissolved Oxygen

- High stress in summer of 2002
- Occasional low summer DO in Little Creek in previous years
- Low DO probably not a cause of impairment in normal years, but remains a source of stress in Little Creek

April-October DO Concentrations



*Town of
Chapel Hill
data.*

Little Creek at Pinehurst Dr

Bolin Creek at East Franklin St.

Middle Bolin Creek



Causes of Impairment--Estes Dr. Ext. to E. Franklin Street

- Issues not as clear cut as further downstream
- In-stream habitat is generally adequate, though some degradation is evident
- Midge community composition indicates toxicity in some samples
- Limited chemical analysis did not clearly identify problem pollutants
- Scour impacts likely, especially downstream

Middle Bolin Creek



Near Bolinwood Dr.



Near Village Dr.

Bolin Creek at Homestead Road



Bolin Creek Below Homestead Rd.

Sewer Right of Way



Lower Booker Creek



Causes of Impairment--below Eastwood Lake

- Poor habitat
- Toxicity
- Low dissolved oxygen, esp. in 2002
- Scour (stormflow volume impacts)
- Ecological impacts of Eastwood Lake

Lower Booker Creek



Habitat Impacts

- In-stream habitat poor, especially below US 15-501
- Massive sedimentation
- Limited organic habitat
- Causes:
 - > Past channelization impacts
 - > Altered watershed hydrology
 - > Ongoing riparian area disturbance

Booker Creek Below Willow Drive



Booker Creek Below Willow Drive



Booker Ck. Below Eastwood Lake



Lower Booker Creek



Toxicity Impacts

- Midge community composition indicates toxicity
- Toxicity bioassay indicated toxic conditions below Eastgate Shopping Center
- Limited chemical analysis did not clearly identify problem pollutants
- Highest levels of pollutants in watersheds (PAHs, MBAS, MTBE, metals)
- Highly developed watershed

Lower Booker Creek

Eastwood Lake



- Provides some pollutant removal during storms, but....
- Reduces baseflows and DO concentrations
- Traps woody debris
- Interferes with organism movement
- Changes food type available
- Modifies sediment transport

Lower Booker Creek

Dissolved Oxygen



- High stress in summer of 2002
- Occasional low summer DO in previous years
- Low DO probably not a cause of impairment in normal years, but remains a source of stress

Upper Booker Creek

Above Eastwood Lake



- Stream too small for formal rating (<4m) but biological degradation evident
- Low flow impacts due to geology, size
- Development impacts likely
- Potential impacts of Lake Ellen
- Toxicity bioassays indicate toxic conditions in Crow Branch
- High conductivity and TDS in area of old UNC landfill sites indicate potential source area

Booker Creek at Piney Mt. Rd.



Booker Creek Below NC 86



Other Observations



- Diverse sources of pollution, stormwater
- Most impacts are probably cumulative
- Some specific concerns: dense commercial areas; leaking USTs; occasional sewer overflows; old UNC landfills
- Riparian area disturbance is widespread

Recommendations



- Recommendations provide guidance to CWMTF
- Long-term incremental approach needed
- Organizational infrastructure for ongoing adaptive management
- Watershed-wide strategy to address toxicants
 - > source reduction
 - > stormwater treatment
 - > additional investigation

Recommendations (2)



- Retrofits to mitigate existing stormwater volume impacts
 - >short-term vs long-term
- Stream channel restoration, esp. in lower watershed
- Reestablish riparian vegetation and limit further disturbance
- Protection from future development impacts

What's Next?



Technical Report Contents

- Watershed description
- Biological assessment
- Chemical and toxicological conditions
- Channel and riparian conditions
- Synthesis: causes and sources of impairment
- Recommendations

What's Next?



Schedule

- Draft Technical Report will be completed in Mid April
- No formal public comment/review process for technical reports
- Draft report will be made available to interested parties, with limited review period
- Final report available in early July

Booker Ck. Macroinvertebrates



Location	Date	Habitat Score (max. of 100)	EPT Taxa Richness	EPT Abundance	Bioclassification
Booker Creek at Walnut St.	Feb 01	39	3	7	Not Rated
	Jul 01	38	7	25	Not Rated
Booker Creek at Piney Mt. Rd.	Mar 98		9	36	Not Rated
	Feb 01	80	7	37	Not Rated
	Jul 01	72	4	40	Not Rated
Booker Creek at Barbara Ct.	Feb 01	68	4	24	Not Rated
	Jul 01	57	3	30	Not Rated